Associations of oral temperature with disease outcomes and inflammation in pre-weaned dairy heifers.

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Early detection of diarrheal and respiratory diseases is critical for reducing their impact on pre-weaned dairy calves and improving animal welfare and performance. Body temperature changes can indicate illness or inflammation, and previous work has shown that oral temperature (OT) reliably detects fever in pre-weaned dairy heifers. Our objectives were to evaluate the relationship between OT, health outcomes, and inflammatory biomarker concentrations. This prospective cohort study was conducted at a single commercial dairy farm in central New York where calves were housed in indoor group pens of 20 calves with free access to an automated milk feeder. Female Holstein calves (n = 150) were enrolled at birth and followed through 28 d of life. At 1, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26 and 28 d of life, health assessments were conducted using the UW-Madison Calf Health Scoring App, and oral and rectal temperatures were measured simultaneously with digital probe thermometers. Blood samples (10 mL) were collected at 2, 8, 16, and 24 d of age, with an additional sample collected each week from calves if extreme rectal temperatures were observed (<37.1°C or >39.5°C). Blood samples (n = 550), selected to balance for age and health status, were analyzed for IL-10, tumor necrosis factor (TNF), and IFN-γ. Linear mixed effects models were used to evaluate the associations between OT and diarrheal and respiratory diseases. Results indicated that both age and respiratory disease were associated with increased OT, whereas diarrhea was associated with decreased OT (all $P <$ 0.01). IL-10 was negatively associated with OT (P = 0.03), whereas IFN-γ was positively associated with OT (P = 0.04). TNF showed no association with OT (P = 0.57). In summary, a similar relationship between inflammation and OT was observed as is known to exist with rectal temperature. Thus, our findings suggest that OT might be a useful tool in monitoring health of pre-weaned dairy calves. Future work should explore diurnal and feeding-related differences in OT patterns, and patterns throughout the course of disease.

Key words: Oral temperature, calf health, cytokines